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Conjoined Twins

At a meeting of the Central Veterinary Society on November 3rd, 1955, papers on the subject, illustrated by lantern slides and a film, were read by Professor Ian Aird, Professor of Surgery, Post-graduate Medical School, Hammersmith, and by Mr. G. H. Arthur, of the Royal Veterinary College, Streatley. Professor Aird reviewed the subject generally, and Mr. Arthur spoke on the veterinary aspect. We publish below a précis of Professor Aird's paper, followed by that of Mr. Arthur.

PROFESSOR AIRD said it was a little embarrassing speaking to an audience which was out of his own field and he was afraid that they were going to be disappointed in some respects. The paper was not on the whole so edifying scientifically, but it was perhaps more interesting in a general way. At Hammersmith they were very conscious of the part played by the veterinary profession in its scientific investigations in the broad field of applied biology. These investigations ran very parallel in the different branches of biology. At Hammersmith they were greatly in the debt of the Royal Veterinary College for the help they had always readily given with the comparative aspects of their problems. He would show 30 or 40 slides which, while illustrating the historical aspects of conjunction in twins, would also point to some of the biological features which were important in the treatment. He knew that veterinary surgeons in their work were not so concerned with the treatment of conjunction, but were more concerned with the obstetrical problems which were raised.

The earliest recorded case of conjunction was that of the Biddenden Twins. The Biddenden ladies led happy and useful lives and they earned the gratitude of their village by bequeathing at their deaths two fields to the village, a charity which still continues. They died in their early forties. When one died the survivor was offered separation but she elected to die with her sister rather than be separated. Her last words were, " Together we came and together we shall go," and that has served as a motto for subsequent twins. The next recorded case was the Scottish brothers who flourished in the time of James III of Scotland. They were separated above the waist but had the same pair of legs. The Filipino Twins came later, and in their late teens applied for American nationality; they were joined back to back. The first evidence of Press interest in conjoint twins was about 500 years ago when twins were born alive in Florence and were commemorated by a bas-relief, which was also the first evidence of Press photography in that connexion! The Italian poet Petrarch composed a Latin sonnet in their honour.

The "original" Siamese twins were really Chinese. They were born in the early part of the last century and were eventually enlisted into Barnum's Circus. They were joined by a narrow bridge, and it is sometimes said that they refused to be separated as they found conjunction lucrative; this does the twins less than justice, because when they became engaged to sisters they sought surgical separation both in Europe and in America, but were refused it. Several surgeons refused to operate because it was thought an operation would be fatal to both. Separation would, in fact, not have been difficult even at that time, as *post-mortem* examination showed.

(*Several slides were then shown of interesting aspects of conjunction*).

Conjoined twins are different, and not "identical" in appearance as other monovular twins. Conjoint twins must be monovular, but they lose exact identity of physical and mental constitution. These metabolic and endocrine differences and differences in temperament are the result of conjunction. If two animals are taken from the same litter and joined together as "Siamese twins" they start by being identical but one soon becomes more dominant and more active than the other, showing a more active metabolism and providing more in endocrine products to the joint organism. The original "Siamese twins" were different in temperament, one was quiet, sober and a little over-economical, while the other was cheerful,

companionable and given to insobriety. They married two sisters and used to live week about in each other's houses. Their progeny, at present, is said to number about a thousand; and in the four generations that have passed were several men of distinction. It had taken four generations for twins to come up again in that family, and this pair of twins were separate.

Professor Aird said it would be remembered that the habit of binovular twinning (two ovulations at the same time) was inherited, but monovular twinning is a matter of chance and the total incidence is one in about 500 births. The family of the "original" Siamese twins had two in a thousand, one at the beginning of the series and one at the end. Slides then illustrated the Blazek sisters and the Chinese twins. The Chinese twins showed one to be perfectly proportioned and of Chinese appearance, but the other was chubbier, had a broader face, and was a congenital eunuch. In the pre-natal period, when the germinal epithelium was laid down, one twin was a little ahead in the endocrine arrangements, which determined that the germinal epithelium of that twin reached completion before the germinal epithelium of the other started to differentiate. Where there was extensive conjunction of the viscera it was not possible for twins to be separated, nor could one be amputated from the other if they were separate only above the waist. Usually twins with an extensive union are stillborn.

The Indian twins Radica and Doodica were illustrated by a picture taken in Paris little more than 50 years ago. The difference here was most marked; one had tuberculous peritonitis, but the other did not appear to have contracted the disease. Professor Doyen of Paris decided to operate and achieved in 1902 the first successful separation of conjoint twins. A film was taken of the operation, though the first cinema was not opened until 1904. The doctor was put to some difficulty because it was rumoured he was showing the film to the general public for financial profit; he only stopped the rumour by fighting a duel! One of these sisters survived for four months before dying of tuberculous peritonitis.

Professor Aird then showed a slide of the result of a successful operation, illustrating a thigh scar by which the twin was separated from her sister in October, 1912. The operation was performed at a military hospital at Portsmouth by an R.A.M.C. doctor, but his identity remained unknown. The hospital had gone and the records with it; and the War Office had no surviving record of the man who performed the operation successfully and without fuss. In this case the twin sister survived for four months, and then died from what was said to be pneumonia, but is now believed to have been a congenital heart anomaly which is fairly common in one, but not in both twins.

A successful operation had also been done in Minnesota by Dr. Holm, on conjoint twins joined by a narrow band. He separated them in 1927 and they still lived nine years later. In 1932 Dr. Maclaren successfully separated Nigerian twins who have survived until now. There had been a spate of successful separations since. One pair (illustrated) joined at the pelvis, were successfully separated in New Orleans, one child being left with a colostomy. Dutch twins were also separated in Holland; the livers were joined by a narrow fibrous band which contained a large blood vessel which had to be clamped and ligated.

On three or four occasions conjoint twins had been diagnosed before birth. In one case of pre-natal diagnosis the twin was joined by the head—a cranial conjunction. Dr. Crichton of Bournemouth had made a pre-natal diagnosis of abdominal conjunction by observing the close apposition of twins in the womb facing each other, their spines bent abnormally backwards and their heads bent far backwards also.

Another slide shown by Professor Aird illustrated a case, which he had an opportunity of dissecting, of stillborn twins extensively conjoined. The umbilical vessels showed two veins on each side of the bridge and two arteries. The livers were conjoined and extremely difficult to divide without damage to large vessels and bile ducts. Another picture showed abdominal viscera so extensively conjoined that separation would have been quite impossible. The lecturer explained that there can be so great a degree of anatomical perplexity that one must go to great lengths to investigate, and to decide, how extensively twins are joined. Twins stillborn at Bexhill were illustrated which were joined up to the neck. It was not possible to compare cases for there might be any degree of conjunction, and any part of the body might be joined to the corresponding part of the other twin.

In conclusion, Professor Aird said the film he would show them was of the Nigerian twins separated in London. The surgery was not remarkable, as the operation could have been done by any competent surgical team. He would ask them to note the high excellence of the photography; the photographer, Mr. Schofield, had only one chance to do it. He took between 16,000 and 17,000 ft. of film, and only about 250 ft. was cut. They would see 1,450 ft. of it.

(The film was then shown and Mr. Arthur's paper followed)

FIG. 1.—Diprosopus—Friesian; full-term calf. Dystocia relieved by traction. Note dissimilarity in face colour pattern. (Mr. E. I. Williams, M.R.C.V.S., Carmarthen.)

Conjoined Twins—the Veterinary Aspect

BY
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DOUBLE monsters, conjoined twins, and identical twins are believed to have a common origin and to result from differing degrees of splitting of the zygote.

Incidence in Cattle

In veterinary literature double monsters are described in the oldest text-books, but only in recent years has the occurrence of identical twins received attention. Paradoxically, however, although double monsters are obviously apparent and have attracted attention throughout the years, while identical twins are difficult to diagnose and have been studied mainly in the last two decades only, there is more information on the incidence of monozygous twins than on monsters. The reason is that monsters have not occurred often enough to constitute a problem of economic importance, while monozygous twins have become valuable for research work and therefore much sought after.

The only factual evidence on the incidence of bovine double monsters has been supplied by Keller and Niedoba (1937). These workers notified all practising veterinary surgeons in three Austrian provinces of their interest in double monsters and, as a result out of a cow population of 700,000, they received seven specimens in one year. Some monsters, of course, may not have been reported by the farmer to the veterinarian, but it was taken that at least one birth in a 100,000 yielded a double monster.

Figures for the incidence of identical twinning in cattle may come from embryological investigation of abattoir material—where the presence of two embryos in the company of a single corpus luteum is significant; or data may be obtained by the clinical examination of like-sexed twins for evidence of monozygosity. By assembling the available published data, Arthur (1956) has found figures of 1.2 and 5 for the percentage of indentical twins among all twins, obtained by the two methods respectively. If it is accepted that one per cent of bovine births gives rise to twins, then the respective incidences for identical twins among all births would be 1 in 8333 or 1 in 2000. It may be noted in passing that in man, up to 40 per cent. of twins may be monozygous.

Of relevance to the foregoing is the fact that, despite intensive studies in Sweden (Bonnier, 1946; Johansson & Venge, 1951) and in New Zealand (Hancock, 1949) the diagnosis of monozygous twins is by no means a certain matter. Of necessity, monozygous twins are of like-sex, the basic body colour is the same, and where there is a colour pattern, although a striking similarity usually exists, quite marked variations can occur. Particularly is this so with the so-called "mirror-imaging" in which adjacent areas rather than corresponding areas are more alike in colour pattern. The general bodily conformation is a good guide, and, in particular, the outline of the body at the tail-head, due to the disposition of the hair tufts, is a useful criterion (Bane, 1950). The use of muzzle prints in establishing identity has not proved altogether reliable or convenient (Wiener, 1954). The final assessment is therefore rather subjective, and is based on a collective appraisal of several characters.

FIG. 2.—Dicephalus—Shorthorn: full-term heifer calf. Dystocia relieved by traction in posterior presentation. (Mr. R. M. Loosmore, B.V.SC., M.R.C.V.S., Reading.)

FIG. 3.—Duplication of head, spine and tail. Shorthorn: full-term heifer calf. Unrelieved dystocia associated with uterine rupture. (Buckingham Abattoir).

Species Incidence

If it is assumed that conjoined twins and identical twins result from a similar process, it would seem reasonable to expect a correlation in the species incidence of the two phenomena. As long ago as 1832, Gurlt had concluded that double monsters were more frequent in cattle than in other farm animals and this is also current opinion. The modern belief, too, is that identical twins occur mostly, even solely, in cattle. There is equally good agreement that in the equine species double monsters and identical twins are extremely rare. The position in regard to the other species is not definite. It is certain that in sheep, and more particularly in pigs, double monsters are not uncommon, and they also occur occasionally in the dog and cat; yet in all these species there are no records of identical twins. One is forced to the belief, however, that if search were made, monozygous twins would also be found in sheep and among litters of pigs, puppies and kittens. So far, there has been no economic need for such an enquiry and obviously among a litter of Large White pigs, for example, it would not be an easy task.

In respect of the sheep, at this institute, a presumed case of monozygous twinning has recently been observed. The diagnosis was on embryological evidence in a case of triplets of one month's gestation In the right uterine horn two foetuses shared a common chorion, with one corpus luteum in the right ovary. Occupying a separate chorion in the left horn was another foetus, corresponding to a single corpus luteum in the left ovary. There was no sign of a recently regressing corpus luteum in either ovary. It was therefore concluded that the twins in the right chorion were of uniovular origin.

Morphology of Conjoined Twins

Conjoined cattle twins form a graded series from a slight duplication, more usually affecting the anterior part of the body, to almost separate individuals, or Siamese twins. The impression has been gained that the degree of embryonic fission is typically less than in man, and that true Siamese twins are uncommon in animals. Various descriptive names have been given to these monstrosities according to their line of amalgamation—whether dorsal or ventral, or affecting the head or rump. Some specimens from several species obtained in recent years are shown in Figs. 1 to 6.

Acardiac Monsters

Among the anomalies of development which are related to fission of the zygote is the *acardiac mole*. This is not uncommon in cattle and probably is more frequently seen by farmers than veterinary surgeons because usually it is not associated with a clinical abnormality. At the Field Station of the Royal Veterinary College in the last three years, four of these acardiac, but nevertheless, attractive little monsters, have been collected (Figs. 7 to 9). They are believed to be derived from an unequal splitting of one blastocyst and they are found attached to the placenta of a normal calf. They are usually nearly round, weigh a pound or two, and have a well-developed skin, with normal colour pattern and hairs. Ectodermal derivatives such as mouth and anus may be present—and occasionally viscera—but usually the specimens comprise very thick skin, enclosing only adipose connective tissue. They have an afferent and an efferent blood vessel, which are connected to the allantoic vessels of their normal twin. They probably reside inside the chorion of the other calf and are liberated at birth. Alternatively, they may be discovered *in utero* by the veterinarian when he is called to remove the afterbirth.

The Cause of Embryonic Fission

From the veterinary standpoint much interest centres around the cause of identical twinning and double monster formation. Whatever the cause it must operate very early in gestation—probably within the first two or three weeks. At this time the embryonic *milieu* is a complex of biochemical processes in which genes, organisers, enzymes, evocators. vitamins and hormones play their part. Proliferation and differentiation occur so rapidly that the system must be very susceptible to deleterious influences, imbalances or deficiencies. Thus it is perhaps surprising that congenital defects and monstrosities are not more common. Perhaps they are commoner than is known and do not become obvious because of their association with lethal characters which lead to embryonic resorption, or early abortion. It is well-recognised that in human embryos and aborts there is a relatively high incidence, even up to 50 per cent. of developmental anomalies.

According to Browne and Browne, in their *Post-Graduate Obstetrics and Gynaecology* (Ballantyne), writing in 1904, suggested that the word monster was probably derived from the Latin "monstro"—"I declare" or "I show"—because the birth of a monster was believed to presage some personal or national misfortune or calamity. Monsters were formerly attributed to the gods, the stars or the moon, to evil spirits or to maternal impressions. In Cheshire the common

FIG. 4.—Double pelvic girdle. Suffolk ram lamb at full-term. Dystocia relieved by traction in anterior presentation. (Mr. J. R. T. Marston, M.R.C.V.S.)

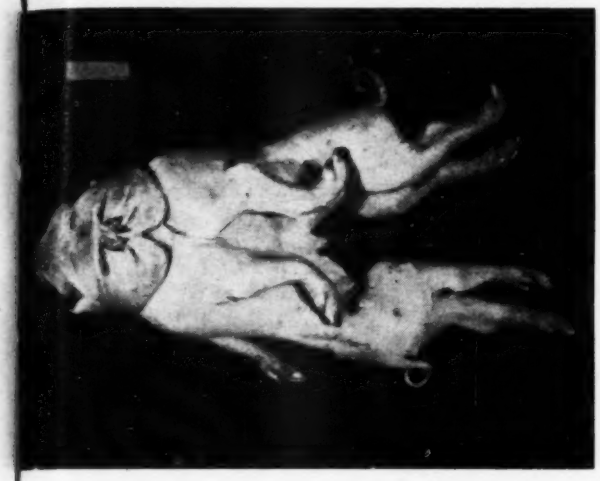

FIG. 5.—Porcine double monster, delivered unaided. Anterior conjunction, rear view of head. (Mr. P. W. Laing, B.SC., M.R.C.V.S., Wallingford).

FIG. 6.— Feline double monster. Delivered by caesarean section. (Mr. L. C. Vaughan, M.R.C.V.S., Streatley.)

FIG. 7.—Bovine acardiac mole. Born at term with a normal heifer; from a 14-year-old Shorthorn cow. Note colour pattern. (Mr. R. B. Rees, M.R.C.V.S., Alresford.)

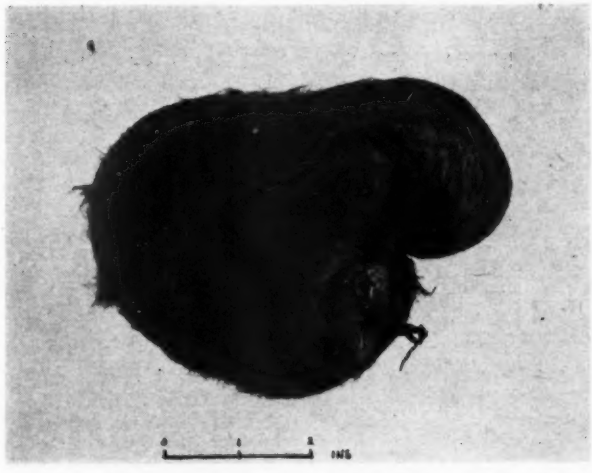

FIG. 8.—Bovine acardiac mole. Born at term, twin to a normal calf; from a Shorthorn cow. Note hair development. (Mr. J. C. Bennison, F.R.C.V.S., D.V.S.M., Oxford.)

FIG. 9.—Acardiac mole of Fig. 8 in cross section. No organ development.

bovine monstrosity *Sobistosomus reflexus* is still referred to as a mooncalf.

The cause of monstrosities may be due to defects in the genes of the germ cells or to environmental influences acting on the developing conceptus *in utero*. Heredity is frequently involved and some developmental abnormalities are inherited according to Mendelian principles. These hereditary defects first appear as mutations; most mutant genes are deleterious and recessive.

Defective Diet

Experimentally, in the lower animals, by varying the environment of the developing egg, numerous abnormalities, including double monsters, have been formed. Amongst environmental influences which have been implicated are defective diet. For instance, sows fed diets deficient in vitamin A in the first 30 days of pregnancy gave birth to piglets with various eye defects—as well as cleft palate. If these animals were mated with each other and fed normally, normal litters resulted. Riboflavin deficiency in rats has also been found to cause cleft palate.

Embryonic anoxia

This is another definite cause of trouble. For example, if pregnant mice were exposed for five hours to an atmosphere corresponding to an altitude of 25,000 feet various congenital defects were produced.

Infections

In the female there is the now well-known association of an attack of German measles within the first three months of pregnancy, with serious congenital defects in the new-born. It is not beyond the bounds of possibility that animal infections may operate in a similar way: in fact, there is evidence that swine fever virus does so. Williams (1931) asserts that monsters occur in animal groups where genital disease is most common. From a considerable experience of trichomoniasis, brucellosis and vibriosis in herds the present writer has been unable to confirm this.

Irradiation

Nowadays the importance of certain rays in producing congenital defects is receiving attention.

Finally, the relative importance of genetic as against environmental factors in the causation of monstrosities is not known. However, so far as one can see in cattle, if a cow survives a labour with one monstrosity, there is no tendency for it to become pregnant with another abnormal foetus.

Practical Implications

In conclusion, it is necessary to consider the practical implications of this subject in veterinary science. This resolves itself into the question, what is the economic importance of animal identical twins and double monsters?

Generally speaking, twins, whether fraternal or identical are undesirable in cattle. They tend to be associated with abnormalities of birth and of the puerperium. Gestation is often abbreviated, and, as a result, the calves may be small and not thrive well. When full-term birth occurs with twins, there is often dystocia from uterine inertia due to overstretching of the womb, or from the simultaneous entry of two foetuses into the birth canal and their consequent impaction. In both cases labour is protracted and stillbirths are likely. Sub-involution commonly follows, with retention of the membranes and metritis. Subsequent conception may also be retarded.

Identical twin calves are in demand nowadays by research institutes. Having the same genetic constitution, they form ideal pairs for investigating the effects of environmental factors on growth and production.

Conjoined twins or double monsters in a uniparous species like the cow cause very serious dystocia. Firstly, they present the difficulty of diagnosis to the veterinary obstetrician. It is not always easy to recognise whether one is dealing with free twins or with a conjoined monstrosity. In cattle, since labour is often allowed to go on too long before veterinary aid is sought, the foetus is quite frequently dead before the veterinary surgeon arrives. Whether it is alive or dead the obstetrician is usually faced with three alternatives for delivering the calf:—

(1) Can the mother be safely delivered by forced traction?

(2) If not, the diameter of the foetus must be reduced by appropriate embryotomy, *e.g.* the removal of a head and neck from a double-headed monster presented anteriorly. This is the course usually followed.

(3) Where simple embryotomy cannot be performed or where it is not likely to lead to delivery, caesarean section can be carried out. Such operations have become much more popular in recent years. It should always be remembered, however, that even a hysterotomy for the removal of a grossly over-sized monster may prove a very difficult task.

The upshot of all this that *live* double monsters are not commonly encountered in veterinary farm practice. Even if they were, it is unlikely that surgery would be called for in the separation of animal Siamese twins. This is due to economic considerations. In small animals, should live conjoined monsters be encountered, surgery could be attempted, but it is likely only to be undertaken as a surgical exercise rather than in response to a request. Finally, if genetics play any part in the origin of such anomalies, veterinary surgeons may remember that it is their prerogative not to propagate the unfit.

Acknowledgments:—The writer is much indebted to the veterinary surgeons mentioned in the captions to the figures for forwarding specimens, and to Messrs. P. Henfrey and W. L. King for technical assistance.

(Continued at foot of col. 1, page 393)

A Preliminary Investigation into the Adjuvant Action of Some Substances on Dried Contagious Bovine Pleuro-pneumonia Organisms

BY

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PRIESTLEY (1955a, b) has recently reported that dried pleuro-pneumonia organisms reconstituted in saline or broth failed to produce immunity on injection into cattle; but if the reconstituted suspension was mixed with an equal volume of 1 per cent. agar in saline (melted and cooled to below 50° C.) and then injected, immunity was readily and rapidly produced.

These findings have been amply confirmed in this laboratory. However, since the use of agar in the way devised by Priestley would present difficulties of manipulation by the non-qualified and often inexperienced field staff, the writer has surveyed the adjuvant action of some 16 substances with the object of finding some simpler substitute.

Owing to the small number of animals used, the results recorded in this paper can by no means be claimed to be conclusive. Nevertheless, since serum from all animals was subjected to the flocculation test (Priestley, 1951) before and after vaccination, it has been possible to distinguish those animals with specific (as opposed to non-specific) immunity and thus to obtain a fairly reliable indication of adjuvant action.

Materials and Methods

Cattle

All cattle were Sudan Zebu, aged between two and three years. All were shown to be negative to the slide flocculation test immediately prior to inoculation.

Vaccine inoculations were contained in doses of 0.2 ml. given in the tail about 1 inch from the tip.

Three weeks after inoculation all cattle were retested for flocculating antibody and, one week later, were challenged by the intramuscular injection of 1 ml. virulent culture.

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Dried Organisms

In the majority of the experiments, the dried organisms used were those originally prepared by Priestley (1955b) and since stored in a deep-freeze cabinet. Briefly the method of preparation was as follows:—

Organisms from a two-day growth of a 12th generation culture were suspended in distilled water to give a density equivalent to tube 30 of the Brown Scale. To this was added an equal volume of freshly inactivated sterile horse serum and the mixture was tubed and dried (Priestley, 1952).

In two experiments (mucin and egg yolk), the organisms were freshly prepared in a similar way but dried in conjunction with the test substances.

Substances Tested

The substances tested can be classified under four headings:—

(a) *Mineral salts.*
- Aluminium hydroxide (0.2 per cent.)
- Barium sulphate (1 per cent.)
- Bismuth chloride (1 per cent.)
- Calcium chloride (0.5 per cent.)
- Magnesium silicate (1 per cent.)
- Magnesium trisilicate (1 per cent.)

These solutions (or suspensions) were prepared in distilled water. The strengths represent the highest concentrations from which growth was obtained by loopful subculture one hour after mixing 10 ml. of the solution with dry contents of one ampoule.

(b) *Polysaccharides:*—
- Maize starch (3 per cent.)
- Bleached gum acacia (3 per cent.)

Colloidal suspensions of the above were prepared by boiling the powders in normal saline for 15 minutes and then cooling.

(c) *Peptone and Proteins:*—
- Bacto-peptone (2 per cent.)
- Bovine albumin (10 per cent.)
- Bovine gamma globulin (5 per cent.)

These were made up in normal saline, heating only in the case of bacto-peptone.

Gastric mucin. This was prepared by mixing 0.75. g. powdered mucin with 10 ml. plain broth and steaming for 30 minutes. The acidity was then neutralised with loopfuls of 4 per cent. NaOH until the reaction was just alkaline to litmus. Five ml. of sterile inactivated horse serum were then added, thus bringing down the concentration of mucin to 5 per cent.

Egg Yolk.—This was collected from fresh infertile eggs.

(d) *Oils.*

Liquid paraffin
Shell ondina 17 *
Sesame oil

Experiments and Results

Experiment 1

Mineral Salts

Ten ml. quantities of each of the solution or suspensions of the six salts were mixed with the contents of one ampoule of dried organisms, and groups of three bulls were inoculated with each.

All bulls remained negative to the flocculation test and on challenge not less than two animals in each group developed large swellings and died within 40 days. Two of the three controls similarly reacted and died; the third was resistant.

Experiment 2

Starch and gum acacia

Organisms from single ampoules were reconstituted in 2 ml. normal saline and then thoroughly mixed with 10 ml. starch or gum acacia. Groups of three bulls were inoculated.

All six animals failed to react to the flocculation test. Two of the starch vaccine group, all three of the gum acacia vaccine group, and all three controls died within 32 days after challenge.

Experiment 3

Peptone, albumin and globulin

Organisms from single ampoules were reconstituted in 10 ml. volumes of the solutions of the above substances and three bulls were injected with each mixture.

One animal in each group vaccinated with peptone and globulin developed a feeble positive flocculation reaction; two of the three animals vaccinated with albumin gave fairly strong reactions.

On challenge two out of each of the peptone and globulin vaccine groups (including the positive in the latter case) died within 38 days. Both positive albumin vaccine bulls survived without swellings and the negative animals survived after developing fairly large swellings.

Experiment 4

Mucin

Fifteen ml. of the 5 per cent. mucin suspension were mixed with 3 ml. of the freshly prepared standard cell suspension and 1 ml. volumes of the mixture were tubed and dried.

Dried material from separate single ampoules was subsequently reconstituted in 4 and in 8 ml. of normal saline, thus giving final concentrations of approximately 1 per cent. and 0.5 per cent. mucin respectively. Viability counts indicated the presence of 10^7 organisms per ampoule.

Two of three animals vaccinated with 0.5 per cent. mucin vaccine developed strong flocculation reactions and one also developed a tail swelling around the site of injection 16 days after inoculation. Both these resisted challenge. The third animal which remained negative to the flocculation test developed a large swelling after challenge but ultimately recovered.

All three animals vaccinated with 1 per cent. mucin vaccine developed strong flocculation reactions and all resisted challenge.

Two controls developed huge swellings and died, and one developed a mild swelling and recovered.

Experiment 5

Egg yolk

Ten ml. yolk were mixed with 9.5 ml. plain broth (batch A). Separately, 25 ml. yolk were mixed with 24.5 ml. plain broth (batch B). To each was now added 0.5 ml. standard cell suspension. Several 1 ml. volumes of each mixture were then tubed an dried. The material from one tube of batch A was subsequently reconstituted in 5 ml. normal saline (giving a final concentration of yolk of 10 per cent.), while that from one tube of batch B was reconstituted in 2 ml. saline (giving a final yolk concentration of 25 per cent). Groups of three cattle were inoculated.

All six animals developed positive flocculation reactions and one in each group developed fairly severe tail reactions. All resisted challenge, while two of the three controls developed large swellings and died.

Experiment 6

Oils

Because it is impossible to suspend dried organisms directly in oil, the contents of one ampoule were suspended primarily in 1 ml. saline and this was then mixed thoroughly by shaking with 9 ml. of the oil to be tested. Groups of four cattle were inoculated.

None of the animals vaccinated with sesame oil vaccine reacted to the flocculation test and on challenge three reacted and died; the fourth died of other causes a few days after challenge.

Of the animals vaccinated with liquid paraffin vaccine, three became positive to the flocculation test and one of these developed an ulcer at the site of the injection and ultimately dropped its tail tip. The fourth animal remained negative. On challenge all three positive animals proved to be immune while the negative one developed a large swelling and died 35 days later.

All four bulls vaccinated with Shell ondina 17 vaccine developed positive flocculation reactions and three of them developed mild tail ulcers. On challenge all four proved to be immune.

Three controls developed swellings and died within 48 days, while the fourth developed a mild swelling from which it recovered.

Experiment 7

Shell ondina 17 oil

Dried organisms from 2 ampoules were reconstituted in 2 ml. normal saline. One ml. was shaken up with 8 ml., and the other with 19 ml. Shell ondina 17 oil. Each emulsion was injected into nine bulls.

Of the bulls receiving the suspension made up to

* A light form of liquid paraffin.

10 ml., five gave positive flocculation reactions; four of these also developed local swellings and ulcers at the site of inoculation which caused sloughing of the tail tip in one animal. All five positive animals and one negative resisted challenge. Of the remaining three, two developed large swellings and died within a month while the third developed a transient swelling from which it recovered.

Of the bulls receiving the suspension made up to 20 ml. seven gave positive flocculation reactions. All seven showed tail lesions, five of which were in the form of mild swellings and ulcers and two caused sloughing of the tail tip. All these seven resisted challenge. The remaining two developed swellings and died within 32 days.

All four controls developed swellings and died within 47 days.

The results of all these experiments are summarised in Table I.

TABLE I

Substance tested for adjuvant action	Number of animals tested	Number reacted floccula-tion test	Number survived challenge without swelling
Aluminium hydroxide ...	3	—	—
Barium sulphate	3	—	1
Bismuth chloride ...	3	—	—
Calcium chloride... ...	3	—	—
Magnesium silicate ...	3	—	—
Magnesium trisilicate ...	3	—	1
Maize starch	3	—	1
Bleached gum acacia ...	3	—	—
Bacto-peptone	3	1	1
Bovine albumin	3	2	2
Bovine gamma globulin	3	1*	1
Mucin (1%)	3	3	3
Mucin (0·5%)	3	2	2
Egg Yolk (10%)	3	3	3
Egg Yolk (25%)	3	3	3
Sesame oil	4	—	—
Liquid paraffin	3	3	3
Shell ondina 17	22	16	17

* Died on challenge.

Discussion

The four possible adjuvants (liquid paraffin, Shell ondina 17, egg yolk and mucin) are, from the standpoint of field work, simpler to use than agar. Whether they are equally efficient cannot be judged by the present limited work. However, it has been observed during the course of this work that the flocculation reaction of sera from animals inoculated with the two mineral oil vaccines was less intense than the usual reaction following inoculation with agar vaccine. This may mean that the mineral oil vaccines produce less solid or less lasting immunity than agar vaccine. If this proves to be so a possible improvement may lie in using organisms of younger generations.

As regards egg yolk and mucin vaccines, the intensity of flocculation resulting from their use was comparable to that caused by agar vaccine.

Priestley (1955b) found that concentrations of 10 and 25 per cent. yolk, tested in groups of four animals, were only partially successful. Since some of his cattle became infected with rinderpest, it is possible that a high febrile reaction interfered with the efficacy of the vaccine. Another possible explanation of the discrepancy is that the strain used by Priestley in yolk vaccine was inherently lower in virulence than the one used in the experiments recorded here.

Summary

1. Sixteen substances have been examined for adjuvant action on dried pleuro-pneumonia organisms.

2. Six mineral salts, starch, gum acacia, bovine gamma globulin and sesame oil were unsuccessful as specific immunity could not be demonstrated.

3. Bovine albumin, liquid paraffin and mucin (0.5 per cent.) gave hopeful results. Two out of a group of three bulls vaccinated with dried organisms mixed with 10 per cent. bovine albumin, two out of a group of three vaccinated with organisms in 0.5 per cent. mucin and three out of a group of four vaccinated with organisms in liquid paraffin developed flocculating antibody and resistance to challenge.

4. Of 24 bulls vaccinated with organisms in Shell ondina 17 oil, 16 developed flocculating antibody and 17 resisted challenge.

5. Egg yolk dried with the organisms and reconstituted in saline, to give final concentrations of 10 per cent. and 25 per cent. yolk; and mucin, similarly dried and reconstituted to give a final concentration of 1 per cent., stimulated antibody production and immunity on injection into groups of three cattle.

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THE NUTRITION SOCIETY

The Nutrition Society is holding a symposium on "Grassland and the Feeding of Livestock" in the University of Reading on July 20th, under the chairmanship of Professor H. D. Kay. Veterinary surgeons who are interested in this subject can obtain further information from the honorary programmes secretary of the Society, Dr. R. J. L. Allen, c/o Beecham Foods, Ltd., Brentford, Middlesex.

The Laboratory Mouse in Great Britain*—I. Husbandry

BY

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THE mouse is used for research in various branches of biology and medicine to a far greater extent than is any other animal in this country. Perhaps the main reason for this is its cheapness, but it has other distinct advantages in specialised fields as well. It is very readily bred on a large scale and is relatively cheap to feed, the cages used need be neither large nor complicated, the intervals between litters are not long and the litters themselves can be large. As well as the fact that there are numerous characters susceptible to analysis, the intervals between generations is not unduly long, and hence the mouse is the mammal of choice for geneticists. For the microbiologist and immunologist it is undoubtedly the most convenient mammal in which to study phenomena of infection and resistance, and for the pharmacologist it is economic of scarce or expensive test materials. In the hospital laboratory concerned with diagnostic procedures it can give results with the minimum of delay, and the work of Topley and Webster and their associates has demonstrated its value in the experimental study of epidemiological problems.

But it also suffers from a whole host of infections of its own—Dingle (1941) lists more than two dozen of the more important and this is certainly an incomplete list—and any of these may interfere, sometimes very seriously, with research programmes in which mice are used.

In a survey made by the Laboratory Animals Bureau in 1953 (see Lane-Petter, Barber & King, 1955) it was found that the laboratory mouse accounts for as much as 67 per cent. of all the animals used in Great Britain in 1952—a total of 1,180,840 mice, a figure which will be at least equalled in 1956. In another publication (Lane-Petter, 1953) mice are estimated to account for 79 per cent. of the total animals used (rats being second with 8 per cent.) and 43 per cent of the total cost of laboratory animals (guinea-pigs being second with 18 per cent.). The total expenditure on laboratory animals—excluding costs incurred once an experiment has begun—was of the order of £200,000. In other words mice play an extremely important rôle in biological work and are, in fact, almost indispensable in certain types of research. But what of the quality of these animals? Are they 100 per cent. reliable? Do they give different workers reproduceable results? Do they give the "right" result first time, or does the test need repetition because one suspects that unwanted factors such as latent infection were at play? The suitability and reliability of a mouse for a given purpose will depend upon many factors; but one of the most important and generally applicable of these will be freedom from infection—or perhaps one should say freedom from unsuspected infection, or freedom from the type of infection capable of vitiating the particular work in hand. And are British laboratory mice free from unwanted disease? Is the user of mice being given reliable animals? In too many cases he is not. The 1953 survey showed that 57 per cent. of the mouse-using establishments reported no losses, while the remaining 43 per cent. noted losses totalling 21,651, or just under 2 per cent. of those used. Two per cent. may seem low (it is probably only half the real loss) but this represents a very considerable loss in terms of experimental results nullified or rendered equivocal and no longer clear-cut. Many establishments had complaints to make about the quality of the mice they bought or used. As a result of this survey, "the conclusions are clear cut. There is need for the improvement of the standard of hygiene and control of infection in mice in particular . . ."

The Laboratory Animals Bureau has instituted a programme for the investigation of diseases in laboratory mice in an attempt to raise the general standard of quality of these animals and, as a result of a preliminary survey, a number of important points have come to light. Problems of intercurrent infection are inextricably bound up with questions of breeding methods and colony maintenance, and no discussion of the former is complete if matters of general husbandry are not considered also. In subsequent publications it is hoped to consider the various major infections of mice which are found currently in this country, but here it is proposed to describe the broad field of mouse husbandry as practised at present. It is hoped that every mouse-user will find it of interest to compare the conditions in his own colony with those obtaining throughout the country as a whole.

Scope of Data

Only 27 out of a total of 177 colonies accounted for 90 per cent. of the 1952 mouse consumption, and in this survey 30 establishments have been visited (including four commercial breeders) which were chosen so that about 90 per cent. of the 1955 consumption might be covered. Four types of colony may be recognised—the commercial breeder (breeding mice for sale as a commercial proposition); the user-breeder colony (laboratories breeding all or most of the mice which they themselves use); the user colony (laboratories buying in all or most of the mice they use from an outside source); and the cancer colony (including genetics colonies—breeding and using their own mice for the study of problems in cancer and genetical work). For convenience all colonies discussed in this survey have been numbered and are listed in Table I. The 12 colonies buying in all their

* This work was supported in part by a grant from the British Insulin Manufacturers.

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TABLE I

LEADING MOUSE COLONIES, 1955

Class	Colony number	Weekly production	Totals
Commercial Breeders	13	5,500	
	14	1,500	
	15	6,000	
	16	3,500	16,500 for 4 colonies
User-Breeder Colonies	1b	600	
	1a	1,200	
	2	900	
	5	100	
	8	800	
	9a	20	
	10a	350	
	11	170	
	12b	100	
	21	2,000	
	24	2,750	
	25	200	
	27	1,000	
	29	700	10,890 for 13 colonies
		Weekly consumption	
User Colonies ...	4	200	
	7	200	
	9b	36	
	10b	800	
	12a	5,087	
	18	500	
	20	450	
	22	3,200	
	23	980	
	26	1,100	
	28	1,000	
	30	250	13,803 for 12 colonies
		Number in colony at any one time	
Cancer Colony ...	6	7,000	
	19	4,500	11,500 for 2 colonies
	3	13,500 used per year	

mice obtained them from the four commercial breeders included in this survey, another four not included in this survey ("T," "H," "A" and "F"), one dealer, three other breeding colonies and one unspecified source referred to as "Special." Table II shows the number of mice bought by the user colonies in reference to their source.

The user and user-breeder colonies included in this survey account for some 23,740 mice per week, of which the commercial breeders' contribution of 9,900 represents roughly 42 per cent. Of the 13,800 used each week by the user colonies, 94 per cent. derive from commercial sources.

Caging

The question of space and cage size has been discussed elsewhere and will not be considered here (Tuffery, 1955).

Among commercial breeders wood seems to be the preferred material for mouse cages. Its cheapness appears to override its disadvantages, such as difficulty of cleaning, shortness of life, etc., although it does conserve heat better than metal boxes. In design the boxes are very simple—there is a small nesting compartment filled with hay at one end, and a number of holes covered with wire netting provide ventilation. Most commercial breeders feed a damp mash to their animals, a procedure which removes the necessity for both hoppers and water-bottles. Cheapness again appears to be the controlling factor.

Only three cancer colonies have been visited during this survey but another six at least are listed in the current edition of the Laboratory Animals Bureau Catalogue of Uniform Strains (revised July, 1955) in which are described the caging and feeding systems used in these colonies. Of nine colonies, eight used ordinary galvanised iron boxes and one used wooden boxes. Hoppers for cubed food were in general use, although at least one colony placed the food directly on the floor of the cage. Water was generally supplied in drinking bottles, but one colony used open pots.

The user-breeder and user colonies preferred metal cages of one kind or another for most purposes, although glass cages were also used to a small extent. Of the 12 user-breeder colonies, nine bred their mice in galvanised iron cages of a simple box design with hoppers fitted in the lid, or in a battery system (see below). Two colonies used aluminium boxes for breeding with hoppers in the lids. One colony (No. 12b) bred its mice in a battery system in drawer-type cages of painted tin-plate and one user colony which carried out breeding on a very small scale used tin-plate biscuit tins for this purpose.

Three user-breeder colonies (Nos. 1a, 8 and 25) bred all their mice in cages which were really drawers held in a specially designed rack. This "battery" system was also used by two other colonies for housing their experimental animals. On the standard model each drawer measures 18 by 5 by 5 inches and has a hopper and water-bottle fixture at one end. The drawers are housed side-by-side on racks consisting of eight shelves each holding 10 drawers, and are mounted on castors. Thus, each unit (measuring 4 feet 9 inches long, 4 feet 9 inches high and 18

TABLE II

MOUSE SUPPLIES TO 12 USER COLONIES, 1955

Source	Number of colonies in Table I supplied	Number supplied weekly
Commercial Breeder No. 13	2	3,635
" " No. 14	2	980
" " No. 15	7	4,274
" " No. 16	2	1,000
Commercial Breeder "T"	2	750
" " "H"	2	200
" " "A"	1	200
" " "F"	2	700
Dealer "G"	1	1,000
Another colony	1	250
Colony No. 31	1	200
" No. 2	1	500
"Special"	1	114
		13,803

inches deep) consists of 80 drawers and gives in one colony an output of 200 weaned mice per week for a total floor space of just over 7 square feet. Some space needs to be added to this figure for working room, etc., but nevertheless, the battery system seems to be among the most economic methods available.

Hoppers were in use in most colonies of all types although, occasionally, they had to be improvised to fit cages not already designed with them. Hoppers were not used if mash constituted the main food, *i.e.* in commercial breeders' colonies, and part, at least, of two user-breeder colonies. All-glass water bulbs were unpopular and not widely used. Bottles of various types fitted with glass or metal tubes and screw or plastic tops or rubber bungs were used.

Feeding

One of the four commercial breeders (No. 16) fed his mice diet 41 and water *ad lib*—bottles and hoppers were checked and filled as necessary—but the other three reared their mice on a mash containing such items as baby chick meal, bread, milk, dog biscuit, etc., and oats which were usually given separately. A small lump of mash was placed in the cage each day after the routine scraping out.

Cubed diets were widely used among cancer colonies. Of 12 colonies (three visited, nine in the catalogue of uniform strains) five fed these designedly complete diets with no extra supplements (excluding water) but seven colonies gave supplements ranging from greens or oats once or twice weekly to a complicated (and costly) regimen of oats, wheat, greens, bread and marmite, etc.

There was no significant difference in the feeding systems of user-breeder and user colonies. Unsupplemented diet 41 was given by six user-breeder and eight user colonies, and diet 41 with some kind of supplement was given by three of the former and two of the latter colonies. " Rowett " cubes (Thomson's formula) were used by three user-breeder and two user colonies unsupplemented. Wet diets were not widely used unless for experimental purposes. Table III summarises current feeding practice among 42 of the largest British colonies.

TABLE III
FEEDSTUFFS FOR LABORATORY MICE, 1955

Feedstuff	User colonies	User-breeder colonies	Cancer colonies	Commercial breeders
Diet 41	8	6	1	1
„ 41 + supplements	2	3	—	—
Diet 86	—	—	1	—
„ 86 + supplements	—	—	2	—
" Rowett " cubes	2	3	—	—
" Rowett " cubes + supplements ...	—	—	5	—
Other cubed diets	—	—	3	—
Wet mashes ...	—	2	—	3
TOTALS :				
Cubed diet alone	10	9	5	1
Supplemented cubes	2	3	7	—
Mash	—	2	—	3

Breeding Systems

The breeding systems in use in this country have been discussed in detail elsewhere (Tuffery, 1956) and will be referred to here only in outline. Among commercial breeders a " harem " system is used most widely. One male is mated with four females which are removed as soon as pregnancy is observed, and they are allowed to kindle and nurse their young in separate boxes, either alone or in the company of another nursing female. After weaning the females are returned to the male, though not always to the same one. Selective breeding for the improvement of the stock was not really practised by the four breeders visited—matings were made between apparently healthy, vigorous stock, but in an entirely random manner.

The breeding systems in use in cancer and genetics colonies can be separated into two main groups—that used for maintaining a small number of stock animals for general use, and that used for maintaining the strains and lines held by the colony. A third group of breeding animals may also be distinguished —those animals in which the breeding itself constitutes part of an experiment, *e.g.* back-crossing to locate specific genes. In practice, the amount of breeding within any of these three groups fluctuates and it is difficult to differentiate these groups for the purposes of a general survey. The stock mice might be bred by a simple pairs system among a closed population, but other breeding in a cancer colony is governed by the fact that inbred lines require to be sib-mated for their maintenance. The simplest and most foolproof method to achieve this end is to let an entire litter run together for life when they will begin mating among themselves when mature. Thus, one cannot say that one male and four females constitutes the normal breeding unit—the proportions and numbers may vary from box to box. There can also be no definite age at which mating units are assembled, nor any definite data about weaning, which is usually in the region of 21 to 28 days and is carried out when the young appear to be the right size. These conditions were those found in the three cancer and one genetics colonies visited.

Thirteen colonies breed most of the mice they use themselves, and a few user colonies may also breed for special purposes; but if they do it is only on a very small scale. The systems in use were four:—pairs (one male and one female kept together permanently and therefore using *post-partum* mating), trios (one male, two females with *post-partum* mating), harems (one male mated with four females, which are removed prior to parturition and therefore not involving *post-partum* mating), and a modified harem system (the females are not removed at all and therefore *post-partum* mating was used). Table IV summarises these systems. The figures in the final column are calculated from the two previous columns and must be regarded as very approximate; but they do illustrate the enormous variations in efficiency of production between colonies; no one system has a clear advantage over the other three. Only half the colonies show a production rate of at least one weaned

TABLE IV
BREEDING SYSTEMS AND PRODUCTIVITY OF 13 USER-BREEDER COLONIES

Colony number	System	Use of *post-partum* mating	Number of breeding females	Weekly production	Numbers weaned /♀/ week
5	Pairs	+	100	100	1·0
25	„	+	300	200	0·66
1b	„	+	480	660	1·36
9a	Trios	+	48	20	—
10a	„	+	500	350	0·70
8	„	+	500	800	1·60
2	„	+	480	900	1·87
27	„	+	1,800	1,000	0·55
11	Harem	—	500	200	0·40
24	„	—	2,000	1,500	0·75
1a	„	—	1,280	1,200	1·00
21	„	—	4,600	2,000	0·44
24	Mod. harem	+	1,000	1,250	1·25

animal per female per week. Colony No. 9a was not in full production at the time of the survey but all the rest were working at their normal pace. The low figure for Colony No. 21 was known to be partly due to an endemic infection of infantile diarrhoea (January to May, 1955) which at times accounted for a 50 per cent. loss of young before weaning.

Animal Rooms, Temperature, etc.

Sawdust or wood-chips were used as bedding by all four commercial breeders, and three gave hay as a nesting material. The fourth gave shredded paper. In only one other establishment was hay given to mice—sawdust, wood-wool and wood-chips were used in almost all other colonies. The accommodation for the commercial colonies was adequate but by no means perfect. Air circulating systems were lacking, although one had installed an electric fan for withdrawing stale air for use in very hot weather. Heating was entirely absent in one colony but was supplied as seemed necessary in the other colonies by means of oil stoves or electric fires.

Cancer colonies, user-breeder and user colonies maintained their animal rooms at an average temperature between 65° and 75° C., and almost all colonies had thermostatic temperature control of varying degrees of efficiency. Air-circulating systems giving between 6 and 10 changes per hour were in use in eight colonies out of a total of 29.

Humidity is always considered to be of importance in animal welfare but not one of the colonies visited ever measured this factor or ever made any special effort to control it.

Recording

Record keeping, both of production and losses, is surely an essential to the efficient running of an animal colony, and yet it appears that few establishments hold really useful and informative records.

The general attitude among commercial breeders towards the keeping of records is that of economy of time and effort—very few records were in fact kept. Parity of litter, date of birth and size of litter at birth were noted very briefly either on a card attached to the box or by a chalk mark on the side of the box. Replacements of the breeding stock were made by choosing from large healthy second or later litters. No elaborate selection system was ever used. Unless the breeder had sought the advice of a laboratory or the Laboratory Animals Bureau, he was in general unable to produce any accurate records of losses; he counted his losses only when they appeared to him to be larger than usual.

Establishments breeding their own mice kept records which were on the average more detailed and more accurate than those of the commercial breeders, but, nevertheless, there was considerable variation in their completeness. Three kept detailed records of each individual breeding male and female, noting births and deaths, numbers weaned, parity of litters, family histories, etc., and conducted *post-mortem* examinations on the majority of their deaths and culls, and recorded the findings. Another five colonies kept breeding and production records almost as complete, but rarely carried out autopsies. The remaining five colonies maintained records showing weekly production and could estimate such figures as numbers in stock at any one time, or numbers lost during the previous month. The three establishments keeping the fullest records had a very much more complete picture than any other colony of the conditions within their colonies with regard both to production rate and intercurrent infection and losses. They were producing—so far as it is possible to judge—among the best quality mice.

In the user colony group are found the largest mouse colonies in Great Britain, and yet the colonies in this group are on the whole very poorly recorded. Numbers bought are known accurately—they have to be paid for in cash!—but records of losses and *post-mortem* examinations are rare. The main cause of the majority of losses is known, *e.g.* ectromelia or salmonellosis; but the true incidence rate is only guessed at, and the only autopsies done are those demanded by the experiment itself.

As is to be expected, it was found that colonies maintained for cancer and genetics work were carefully recorded so that lines and sub-lines could be maintained strictly inbred, and crosses between lines and mutations and so on were thoroughly recorded. The methods used varied, but the aim was the same in each case—to produce an animal of known ancestry and/or genetic constitution. None of these colonies conducted regular *post-mortem* examinations; only sharp outbreaks of readily diagnosable infections such as Tyzzer's disease were noted, and then but briefly.

General Hygiene and Infection Control Methods

One may differentiate three broad methods for routine cage cleaning. Of 22 colonies only two changed their mice into completely clean cages once or twice weekly. These cages had been scraped, scrubbed in hot water and finally autoclaved before being returned to general use. Nine colonies changed their mice once or twice weekly into newly cleaned cages which had been scraped and scrubbed but not autoclaved. Eleven colonies changed their cages only

infrequently and merely removed the mice into some suitable container, tipped out the old bedding, scraped the box (a somewhat superficial operation in some cases) and replaced the mice after lining the box with fresh bedding. This was done sometimes daily or on alternate days, and sometimes once or twice a fortnight. These boxes were more thoroughly cleaned with a scrubbing brush about once a month or so. Discussion of cage hygiene would not be appropriate here, but it may be remarked that the last method is probably adequate for the really good colony provided that technicians and laboratory co-operate in watching for early signs of disease. The method is not, of course, to be recommended to the colony in the process of tackling an already endemic infection.

Of the four commercial breeders using wooden or partly wooden boxes only one employed a regular wet-cleaning (scrubbing) method. In general the larger compartment was scraped out periodically and a more thorough treatment was given to the boxes as they became empty. This took the form of spraying with gamma benzine hexachloride,* painting with creosote, or blow-lamp treatment.

Several colonies claimed to use a more stringent cleaning routine (*i.e.* more frequent cage changing with steam sterilisation, etc.) as soon as they had any reason to suspect the presence of an unwanted infection in their colony. One wonders how effective these extra precautions were in some cases; but in one or two colonies these methods did seem to give satisfactory results and it is worth noting that they were most successful in colonies where every cage was examined every day by animal technicians trained to recognise the very first signs of sickness in a mouse.

Almost without exception, and particularly in the case of the commercial breeders, culling of any suspect animals was recommended as a sure method for the prevention of outbreaks of disease. Unfortunately, the culling was not always as vigorous as it might have been.

Cumming (1951) has demonstrated clearly the risk of transferring infection from cage to cage by means of water-bottles, and has recommended the use of a specially designed watering hose so that every bottle is always returned to the same cage after refilling. This very neat apparatus was in use in one colony (No. 10) and was there spoken of very highly. In general, however, bottles were refilled two or three times a week and returned to any cage. Only a few colonies took care to ensure the return of the bottle to its original cage—a practice which is to be recommended in view of the infrequency of bottle sterilisation in most colonies.

Food and bedding storage facilities were, in general, below the standard one would like to see, but many laboratories acknowledged this and were improving conditions as fast as room and money permitted. Bedding materials such as sawdust and wood-chips and, to a less extent, wood-wool, are particularly liable to contamination by rats, mice and cats and may, therefore, constitute sources of infection from such agents as *Salmonella* spp. and tapeworms. Care over choice of source of such materials is needed—one commercial breeder had his sawdust bagged in his own sacks direct from the sawbench, and this is probably the most satisfactory arrangement wherever it is possible.

* Gammexane.

Discussion

Viewed broadly it is apparent that laboratory mouse husbandry in this country is not of the standard it might be; if it were, there would be fewer complaints from users. Individual colonies vary widely in the quality of mouse which they produce, but even this factor is not readily assessed. A biologist may continue to use certain mice even though he knows them to be infected with a disease-producing agent: he still manages to produce apparently satisfactory results for, say, toxicity tests.

The series of papers by Bruce and Parkes is especially relevant to this discussion. Bruce (1947, 1954) has attempted to place breeding methods on a sound experimental basis in place of the rule of thumb methods which have prevailed in the past. In her last paper she showed quite clearly the advantages of the " trio " system (with *post-partum* mating) yet only five colonies practise this method at the present time, and two of these can only wean about 0.7 and 0.55 young per doe per week. Other systems may have particular advantages to suit the needs of individual colonies, yet it is certain that, judged simply in terms of production, some of these are uneconomical. It is difficult to judge commercial colonies in similar terms—but presumably they pay!

With the exception of the commercial breeders, cubed diets are used very widely in all types of colonies, and yet one of the chief advantages of these feedstuffs does not seem to be appreciated by some establishments. In the matter of reducing the risk of infection hopper-fed cubes are ideal, but as a labour-saving device their value must be almost completely annulled in some colonies which feed a wide variety of supplements with them. Diet 41 was designed as complete diet in cube form requiring no supplement even during breeding and nursing (Bruce & Parkes, 1949) and was demonstrated by its originators as such. It must be admitted that there may be differences in the nutritional requirements in different strains—Fenton, Cowgill & Stone (1948) consider that differences exist between mice of the A and C57 strains—but the feeding of supplements in most colonies at the present time is almost entirely based on the technician's opinion. In one or two cases experiments have been conducted before a change in diet was contemplated but in many cases these were probably not fair trials.

In matters of general hygiene some colonies seem to practise a fairly efficient system, while others could improve their standards. *Post-mortem* examination of deaths, and culls among stock mice, are made in remarkably few instances, and only on rare occasions (unless the investigator is himself directly concerned) are the laboratory's services called upon. In many cases the introduction of regular *post-mortem* examinations would raise questions of time and labour, but surely this must be done if one is to combat intercurrent infection with any hope of success.

(*Continued at foot of col.* 1, *page* 401)

The Royal Society of Health

Election of Professor H. Burrow as Chairman of Council

At the meeting of the Royal Society of Health Council held on June 12th, Professor H. Burrow, M.R.C.V.S., D.V.S.M., was elected Chairman of Council for the year commencing October 1st, 1956, in succession to Dr. A. Parker, O.B.E., D.SC. He thus joins the long list of distinguished persons who have held this high position, and gains an honour which is singular in that it is the first occasion in the history of the Royal Society of Health when a member of the veterinary profession has been elected to this office.

The Royal Society of Health, with a current membership of over 14,000, was founded in 1876 for the purpose of collecting and imparting information upon all matters connected with the subject of public health. It has become, without exception, the largest public health organisation in the world and is wholly responsible for numerous facets of this important subject, not the least being the qualifying examinations held in most parts of the United Kingdom and the British Commonwealth of Nations. Its members are gathered from many walks of life including the medical, veterinary, engineering, architectural, legal and other professions and work together in harmony to promote the common interest, the health of the people. The great variety of expert knowledge available through its members enables the Society to exert a profound influence upon the many varied fields which come within its scope. That Professor Burrow should have been selected to lead such a privileged body is a token of the high esteem in which he is held by all those connected with the Society.

Professor H. Burrow, M.R.C.V.S., D.V.S.M.

Work for the Society

His association with the Royal Society of Health began 26 years ago when he was employed in local authority public health and veterinary work at Birmingham. Later he became Divisional Veterinary Officer for Derby, and then went into private practice before being appointed to the Chair of Medicine at the Royal Veterinary College, University of London, a position which he has held with distinction to the present day.

During these many years, in company with a small group of similarly public-spirited veterinary colleagues, he has found the time to serve the profession on the examining boards of the Society. In 1950, he became a member of Council, his valuable assistance soon being recognised by his appointment to the Chair of the Examination Committee and, more recently, to the Congress, Meetings and Publications Committee. During the current protracted negotiations involving the various professions concerned with

(*Continued at foot of col. 1, page 402*)

Continued from page 400

Summary

An attempt has been made to describe mouse husbandry as it is practised in Great Britain at the present time. Material for this purpose was collected by personal visits to about 30 of the leading colonies which, between them, account for nearly 90 per cent. of the country's total laboratory mouse consumption. While individual colonies vary somewhat, the overall quality of mice is not as high as it should be and present methods of colony maintenance might be improved, particularly in hygiene and control of infection.

Acknowledgment.—I should like to acknowledge the very great assistance given to me by the research directors and animal technicians at the many establishments visited in the course of this survey.

(*To be continued*)

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Current Literature

BOOK REVIEW

Neurologic Examination of the Dog. J. T. McGRATH. 172 pp. 120 illustrations. Henry Kimpton, London, 1956. Price £1 17s. 6d.

The field of neurology in veterinary practice is yet largely unexplored and is certainly one that will repay study, particularly as it affects small-animal practice. For this reason, therefore, we approached Dr. McGrath's book "Neurologic Examination of the Dog" with the keenest interest and enthusiasm.

A great deal of information is offered for the consideration of the small-animal clinician. After an introductory chapter the author proceeds to the methods of and knowledge required to make a thorough neurological examination of a dog. Very properly the necessity for an adequate and reliable history is emphasised, next methods of physical examination together with certain desirable laboratory techniques are discussed. Chapter four details the distribution of the cranial nerves and mentions briefly certain abnormalities associated with each nerve which may be met; a similar method deals with the other parts of the nervous system in succeeding chapters. The various reflexes used in neurological examination of dogs are then detailed and profusely illustrated. The remaining chapters deal with the pathology of the nervous system. It will thus be seen that much information is afforded for the enlightenment of small-animal clinicians, yet, having read the whole, one is left with the feeling that one has not profited to the anticipated extent from this study. Maybe the fault is with the reader that some confusion of thought persists.

We feel, too, that not all clinicians will find it easy to accept certain of the author's conclusions. For example, he regards "strokes" as extremely rare, yet most of us attribute certain temporary hemiplegic symptoms so often seen in our canine patients to this cause; the reviewer finds it difficult to accept that some of the neurological syndromes in which spontaneous recovery occurs are due to progressive lesions such as neoplasms, which seems to be the author's view. In fact a good deal more emphasis is placed on neoplasms of the nervous system as aetiological factors than would be widely accepted in this country where such lesions are regarded as not common. It seems odd, too, that in referring to hypoglycaemia virus hepatitis should not be included as among its commoner causes.

With regrettably few exceptions, the standard of the illustrations is not good. To the unenlightened, far too many convey nothing at all—a more critical selection of photographs and the use of arrows to identify lesions would have been an immense improvement.

Despite these criticisms the book contains much material that should be available to up-to-date small-animal clinicians, and we believe that its possession and discriminating use will be valuable to many members of our profession.

The Royal Society of Health—*Continued*

the inspection of meat, Professor Burrow has been a member of the R.S.H. delegations to the Ministry of Health and other responsible bodies on a number of occasions, and his wide experience and wise counsel have been of much avail. Furthermore, as recording secretary responsible for the Veterinary Hygiene section of the annual Health Congress, he has the opportunity of fostering the traditions so ably maintained by his predecessor, Major W. J. Brennan De Vine, M.C., F.R.C.V.S., D.V.S.M.

At all times Professor Burrow has had the rightful position of the veterinary profession in public health in the forefront of his mind, and his friends will rejoice in the honour which has come to him. It is to be hoped that he will enjoy the greatest possible support in his future endeavours, for the honour which has come to him adds not only to his own prestige but to that of the whole veterinary profession.

ABSTRACTS

Cowsheds and Milking Parlours. ELGAR, N. E. B. (1956). *Agric. Lond.* **62.** 564–7.

The author discusses the advantages and disadvantages of these two systems. Less floor space per cow is required in a cowshed than in a yard and parlour, less litter is required, and substitutes such as sawdust are more easily used. The observation, handling and individual management of cows is greatly facilitated. On the other hand, more labour is required for the running of a cowshed and a considerable amount of capital is tied up in a building which may be in wholetime use for only five months of the year and which is not easily converted to other uses. It is more difficult to detect oestrus in housed cattle.

The capital cost of the yard and parlour system is usually lower. The system is more flexible, and the yards are a valuable source of dung. A high yielding cow may be unable to eat all her concentrate ration while she is milked, but this difficulty can be overcome by providing yokes in the yard. The equipment of the newer types of parlour is easily dismantled, allowing the building to be used for other purposes and allowing a tenant farmer to remove his equipment on leaving a farm.

E. A. G.

Manganese Deficiency in Pigs. NEHER, G. M. (1956). *Amer. J. vet. Res.* **17.** 121–8.

Pigs reared on an experimental diet deficient in manganese developed symptoms of lameness at about 60 lb. bodyweight. Later the legs were found to be shorter than normal. The carpus and tarsus were enlarged and the fore legs tended to be bowed. The deficient pigs became excessively fat. At 335 days the lameness was no longer apparent, but the bony deformities persisted.

During the growing period the bones showed a generalised rarefaction, with areas of complete rarefaction in the distal diaphyses of the ulna bones, where the cancellous bone was replaced by dense fibrous connective tissue. The disappearance of these rarified areas coincided with the recovery from lameness mentioned above.

E. A. G.

B.V.A. 74th Annual Congress at Royal Leamington Spa

September 16th to 22nd, 1956

Programme

(All meetings will be held in the Great Hall of the Town Hall unless otherwise stated)

SUNDAY, SEPTEMBER 16th

6.30 p.m.
Service at All Saints' Parish Church, Bath Street, Leamington, conducted by the Vicar—Rev. Canon R. C. Streatfield, M.A.

8.00 p.m.
"At Home" given by the Midland Counties and East Midlands Divisions, at the Regent Hotel, Leamington.

MONDAY, SEPTEMBER 17th

10.00 a.m.
Blessing: Rev. Canon Streatfield, M.A. Opening of Congress by His Grace The Duke of Devonshire, M.C. Civic Welcome by the Mayor of Royal Leamington Spa.

10.30 a.m.
Ladies' excursion: Visit to Cheltenham, including Broadway and the Slaughters.

10.45 a.m.
Opening of Veterinary Exhibition by the President, B.V.A.

12 to 1 p.m.
Films.

2.30 p.m.
Paper: "Review of Present Knowledge of Johne's Disease."
Author: Mr. T. M. Doyle, F.R.C.V.S., D.V.S.M.
Openers: Mr. J. B. White, M.R.C.V.S., and Mr. J. D. Rankin, M.R.C.V.S.
Chairman: Mr. A. L. F. Mullen, M.R.C.V.S., D.V.S.M.
Recording Secretary: Mr. D. C. Croft, B.V.SC., M.R.C.V.S.

8.30 p.m. to 1 a.m.
Civic Reception and Dance at the Town Hall, by kind invitation of the Mayor and Corporation of Royal Leamington Spa.

TUESDAY, SEPTEMBER 18th

9.30 a.m.
Paper: "Farm Health Problems: Where Does Britain Stand Today?"
Author: Mr. S. L. Hignett, B.SC., M.R.C.V.S.
Opener: Sir James Scott Watson C.B.E., M.C.
Chairman: Mr. E. R. Callender, O.B.E., M.R.C.V.S.
Recording Secretary: Miss W. M. Brancker, M.R.C.V.S.

10.30 a.m.
Ladies' Guild Annual General Meeting.

2.00 p.m.
Demonstrations by close-circuit Television at the Moreton Morrell Institute, Nr. Leamington (by kind permission of the Principal).

6.00 p.m.
Alumnus Dinners.

8.30 p.m.
Ladies' Guild Dance at the Spa Ballroom, Leamington.

WEDNESDAY, SEPTEMBER 19th

9.30 a.m.
Paper: "Present-day Toxicity Problems: A Review."
Author: Mr. J. L. McGirr, B.SC., M.R.C.V.S.
Openers: Mr. A. Steele-Bodger, M.A., B.SC., M.R.C.V.S., and Mr. N. M. Black, M.R.C.V.S.
Chairman: Mr. W. L. Dwerryhouse, M.R.C.V.S., D.V.S.M.
Recording Secretary: Mr. T. C. Denholm, M.R.C.V.S.

10.30 a.m.
Ladies' excursion: Visit to Kenilworth, Guys Cliffe and Stoneleigh.

11.30 a.m.
Paper: In the Small Hall—"Common Disease of Cage Birds and other less usual Pets."
Author:
Opener: Mr. I. F. Keymer, M.R.C.V.S.
Chairman: Mr. S. Jennings, M.R.C.V.S.
Recording Secretary: Mr. G. V. Laugier, M.R.C.V.S.

12.30 p.m.
Last Meeting of Council 1955/56.

2.30 p.m.
Congress Photograph.

3.00 p.m.
Annual General Meeting, with Presidential Address.

7.30 for 8.00 p.m.
Annual Banquet at the Leofric Hotel, Coventry.

THURSDAY, SEPTEMBER 20th

9.30 a.m.
Paper: "The Anatomy of Disc Protrusion in the Dog."
Author: Dr. A. S. King, B.SC., M.R.C.V.S.
Openers: Mr. S. W. Douglas, M.A., M.R.C.V.S., and Dr. G. B. Brook, F.R.C.V.S., F.R.S.E.
Chairman: Mr. J. S. Steward, F.R.C.V.S., D.V.S.M.
Recording Secretary: Mr. W. H. Carr, B.V.SC., M.R.C.V.S.

9.30 a.m.
Paper: In the Small Hall—"Artificial Insemination in Pigs."
Joint Authors: Mr. C. Polge, B.SC., Mr. L. E. A. Rowson, O.B.E., M.R.C.V.S.
Openers: Mr. D. H. L. Madden, M.R.C.V.S., and Mr. A. F. Holt, B.SC., M.R.C.V.S.
Chairman: Mr. W. P. Stokes, M.R.C.V.S.
Recording Secretary: Mr. M. Steele-Bodger, M.R.C.V.S.

11.30 a.m.
Paper: In the Small Hall—"Foot-rot in Sheep."
Author: Professor W. I. B. Beveridge, D.V.SC. (SYD.), M.A.
Opener: Miss A. I. Littlejohn, B.V.SC., M.R.C.V.S.
Chairman: Mr. J. G. Murray, M.R.C.V.S. DIP. BACT.,
Recording Secretary: Mr. H. E. Roberts, B.SC., M.R.C.V.S.

2 to 4 p.m.
Special Film Programme.
Golf, Tennis, Bowls, etc.

3.00 p.m.
Mannequin Parade at the Lord Leycester Hotel, Warwick (for the ladies).

7.30 p.m.
Free, or visit to Shakespeare Memorial Theatre to see "LOVE'S LABOUR'S LOST" (*Application for tickets should be made immediately to B.V.A. Headquarters.*)
(For those attending this performance arrangements are being made for dinner to be served at 6.30 p.m. at the Red Horse Hotel, Stratford on Avon.)

FRIDAY, SEPTEMBER 21st

9.30 a.m.
Paper: "Animal Diseases from the Point of View of Human Medicine."
Joint Authors: Dr. P. G. Arblaster, M.R.C.P., Dr. A. P. Prior, B.S.
Openers: Dr. N. S. Barron, B.SC., M.R.C.V.S., and Mr. H. T. Matthews, M.A., B.V.SC., F.R.C.V.S., D.V.H.
Chairman: Mr. E. R. Corrigall, M.R.C.V.S., D.V.S.M.
Recording Secretary: Mr. A. F. Ritchie, M.R.C.V.S.

11.30 a.m.
Paper: In the Small Hall—"Examination of the Eye with Special Reference to the Horse and Dog."
Author: Professor C. Formston, F.R.C.V.S.
Opener: Mr. S. F. J. Hodgman, M.R.C.V.S.
Chairman: Major F. Chambers, O.B.E., F.R.C.V.S.
Recording Secretary: Mr. G. Eaton, F.R.C.V.S.

2.30 p.m.
Ladies' excursion: Visit to Compton Wynyates and Ettington Park.

2.30 p.m.
Paper: "Poultry Breeding for Increased Production with Special Reference to Health."
Author: Mr. J. O. L. King, M.V.SC., B.SC., M.R.C.V.S.
Openers: Mr. G. G. Belfield (Sterling Poultry Products, Ltd., Salisbury) and Miss E. E. Kidd (President, Chick Producers' Association, London).
Chairman: Mr. E. G. Morris, M.R.C.V.S.
Recording Secretary: Mr. A. H. Hogg, M.R.C.V.S.

2.30 p.m.
Films

8.30 p.m. to 1 a.m.
President's Reception and Dance at Chesford Grange.

SATURDAY, SEPTEMBER 22nd

10.00 a.m.
Closing Meeting of Congress.
First Meeting of Council 1956/57.

News and Comment

B.V.A. CONGRESS AT LEAMINGTON SPA

Hotel Accommodation

In Leamington Spa

Angel, 145, Regent Street, Leamington, Chesford Grange (three miles).

Private Hotels

Alkerton, Binswood Avenue.
Amersham, Kenilworth Road.
Arden, Clarendon Square.
Bankfield, Newbold Terrace.
Oaks Hotel.
Roselands, Binswood Avenue.
Sheiling, Beauchamp Avenue.
Westella, Leam Terrace.

(still available as at June 14th, 1956)

Outside Leamington Spa

Accommodation is available in all hotels outside Leamington Spa—as published in THE VETERINARY RECORD of March 10th, 1956.

Transport.—Coach transport will be provided for some of the functions, etc., where necessary. Tickets may be obtained by requesting them on the usual application form to be published about mid-August.

Luncheon.—Luncheon facilities for Congress members will be provided each day in a special tent to be erected in the Pump Room Gardens, Leamington Spa.

Shakespeare Theatre.—It will be seen from the programme published elsewhere in this issue that a special visit to the Shakespeare Memorial Theatre, Stratford on Avon, is being arranged for interested members on Thursday, September 20th. The play will be " Love's Labour's Lost," and application for tickets for *this particular performance* should be made to the General Secretary, B.V.A., as soon as possible. Seats for 150 have been reserved by the Association.

If any members would care to make their own arrangements for other evenings in Congress week, the programme is as follows:—

September		p.m.	
Mon.,	17th	7.30	" Measure for Measure "
Tues.,	18th	7.30	" Othello "
Wed.,	19th	2.30	" Merchant of Venice "
Wed.,	19th	7.30	" Merchant of Venice "
Thurs.,	20th	2.30	" Love's Labour's Lost "
Thurs.,	20th	7.30	" Love's Labour's Lost "
Fri.,	21st	7.30	" Hamlet "
Sat.,	22nd	2.30	" Measure for Measure "
Sat.,	22nd	7.30	" Measure for Measure "

ROYAL VETERINARY COLLEGE ASSOCIATION ANNUAL DINNER

On Derby night, Wednesday, June 6th, the first annual dinner of the Royal Veterinary College Association was held in the Refectory at the Camden Town School. Forty-six members attended and enjoyed a delectable meal.

The President of the Association, Professor J. McCunn, presided and after the loyal toast had been honoured he thanked those present for making this, the first festive reunion of former students, such an obvious success. He said that it had been their intention to have two guests of honour present, " Uncle George " (Professor George Wooldridge) and Mr. H. Hitchings. Unfortunately, Mr. Hitchings, who was now over 80 years of age, had been indisposed and his doctor, whilst pleased with his progress, had thought that the excitement of meeting his old friends was too great a risk at the present time. The Secretary would send to Mr. Hitchings a letter conveying their felicitations (applause). " Uncle George " was with them (applause) and except for a little eye trouble they would note that he was in the best of health and spirit. He was sure that they would all like to thank Mrs. Lloyd, Miss Benton, and the Chef for their work to-night (applause). It was not his intention to bore them with a long speech but in a few words to give an account of the progress the association had made and then to call upon their honoured guest for a few words. After this he would call upon another guest, Mr. C. R. V. Jones, the President of the Students' Union, to give them an account of the present activities of the Students' Union, and they would then adjourn to another room where, by the aid of the cinema, they would review some of the great days of the past when they were young and supple.

Guest of Honour, Professor G. Wooldridge, and the President, Professor J. McCunn.

Professor McCunn said that the main object of such an association was to enable them to renew old friendships and to make new friends, but above all to do what they could for the old College. The association had made a good start, there were 74 members already, there were 46 present at the dinner. If each could persuade one more former student to attend next year the success of the venture would be assured.

When Professor Wooldridge rose to speak he was greeted with musical honours. Obviously deeply moved, he expressed his great appreciation of being

Guest of Honour. He was sorry that Mr. Hitchings, who had done so much for the College, could not be present. He delighted the audience with stories of Sir John, James McQueen, Teddy Shave and of the old College.

The cinema show brought back many nostalgic memories to the older members present and gave some substance to their boasts that " we were tough in our day." The younger members expressed surprise at the antics of their elders and especially so when they saw one, who is now a Professor, swinging in the branches of a tree attired as a monkey!

THE RICHMOND ROYAL HORSE SHOW

The Richmond Royal Horse Show was held this year on June 14th, 15th, and 16th, and was designed to meet the needs of the knowledgeable equestrian as well as the general public.

A notable addition to the list of Vice-Presidents to the Society is the Earl of Westmorland, who has been a regular visitor to the show for some years. The Chairman this year is Mr. Horace Smith, one of the best-known figures in the equestrian world, and for the first time Mr. T. A. Dobie, M.R.C.V.S., takes the office of Vice-Chairman, which makes him automatic choice for chairman for 1957.

Mr. Dobie, who lives at Manor Road, Teddington, and who practises in Richmond and district, was appointed to the directorate in 1950, and in addition to being responsible for the panel of honorary veterinary surgeons which examines every horse entering the grounds (and, where necessary, measuring for height), has contributed much of the building up of the Mounted Police Classes. How successful he has been in this objective can be judged from the surprisingly high total of 69 competitors from areas as far afield as Liverpool, Leeds, Birmingham, Bristol, Durham, Manchester, Salford, Staffordshire, City of London, and, of course, the Metropolitan area.

R.A.V.C. OFFICERS' CLUB DINNER

The Annual Dinner of the Royal Army Veterinary Corps Officers Club was held at Grosvenor House, Park Lane, W.1, on Friday, June 8th, 1956.

Brigadier A. G. Ralston, Director of the Army Veterinary and Remount Services, presided and the guests of the evening were the Vice-Quarter-Master-General to the Forces, Major-General J. G. Cowley, C.B., C.B.E., A.M., the President of the Royal College of Veterinary Surgeons, Professor L. P. Pugh, F.R.C.V.S., B.SC., M.A., and the President-Elect of the British Veterinary Association, Mr. E. R. Callender, O.B.E., M.R.C.V.S.

IN PARLIAMENT

LIEUT.-COMMANDER S. L. C. MAYDON moved the second reading of the Rabbits Bill in the House of Commons on June 15th. He pointed out that the Bill was designed to prohibit " certain definite acts concerning live wild rabbits," but was not concerned with tame or domestic rabbits.

He said: " The offences are detailed in Clause 1 which prohibits four distinct actions—the selling of wild live rabbits, the buying of them, the conveying of them from place to place and, lastly, the letting loose of live wild rabbits. Subsection (1) of the Clause details the penalties for these offences and subsection (3) provides for exception in cases where wild rabbits are used for scientific purposes.

" Clause 4 authorises certain exceptions and simplifies procedure, under Section 1 of the Pests Act, where rabbits are required to be kept for scientific research in a rabbit clearance area or where the Nature Conservancy wishes to release rabbits in nature reserves to study their habits and their effect on vegetation and other matters connected therewith."

A very full discussion ensued during which various points of view were expressed with regard to the rabbit as a pest and the most effective way of dealing with it. Lieut.-Commander Maydon moved the reception of the Bill, but the Speaker declined to put the Question to the House at that time and the debate was subsequently adjourned before a vote could be taken.

It is understood that the Universities Federation for Animal Welfare has circularised Members of Parliament urging them to support this Bill which would prohibit the deliberate introduction of wild rabbits. The circular states that " the reintroduction of a dense rabbit population would entail a great deal of (1) cruelty in the commercial exploitation of rabbits; (2) damage to crops, pastures and forests."

INDUSTRIAL CHEMISTRY IN THE SERVICE OF MEDICINE

On the evening of June 20th, Mr. John E. McKeen, President of Chas. Pfizer & Co., addressed the British Association of Chemists at the Savoy Hotel, London, on the subject of Industrial Chemistry in the Service of Medicine.

In the course of his speech Mr. McKeen drew attention to the enormous task of getting penicillin into mass-production. " In 1941 there was just enough penicillin to permit Lady Mary Florey and her colleagues to treat six patients. In 1943, two whole long years later, 29 lb. of penicillin had been laboriously harvested. I repeat that figure: 29 lb. Yet, just another two years later, in 1945, 14,000 lb. of pure penicillin were being produced, and 10 years later still, if I may now jump into the 1950's, more than 756,000 lb. of the antibiotic were being produced in America alone. Such figures tell as plainly as any other way could how the industrial scientist came to enter the picture." He went on to say that " it is not generally known that before the first dose of mass-produced penicillin was marketed, private firms spent nearly £10,000,000 on development. Our kind of research," he added, " must be wedded to technology, which is the utilisation of discovery. And, as we all know full well, in our industry no research development can go into production until pharmacologists and clinicians have determined its value."

R.C.V.S. DIPLOMA IN VETERINARY STATE MEDICINE

On the results of the examinations held at the Royal (Dick) School of Veterinary Studies in Edinburgh from June 7th to 12th, 1956, the following candidates were awarded the Diploma in Veterinary State Medicine:—

Greig, Norman; Kelly, Denis Lane; Mackay, Richard Ross; Williams, Bernard Milton.

PERSONAL

Births

GLAS.—On June 10th, 1956, to Margot, wife of Michael Glas, M.R.C.V.S., of 72, Barton Street, Tewkesbury, Glos., a daughter, Caroline Carmen.

McGHEE.—On June 12th, 1956, to Jane (*née* Palmer), wife of J. H. McGhee, T.D., M.R.C.V.S., of 46, Coten End, Warwick, a son, a brother for Joanne and Sarah.

COMING EVENTS

June

28th (Thurs.). Meeting of the Lakeland Division, B.V.A., at The Hydro, Windermere, 6 p.m.

July

17th (Tues.). Summer Meeting of the Association of Veterinary Teachers and Research Workers (Northern Region) at The Evans Biological Laboratories, Runcorn, 11 a.m.

19th (Thurs.). Annual General Meeting of the Supplementary Veterinary Register Division, B.V.A., at 7, Mansfield Street, Portland Place, London, W.1, 2.30 p.m.

20th (Fri.). Summer Meeting of the Eastern Counties Division, B.V.A., at Cambridge, 11 a.m.

Summer Meeting of the Mid-West Division, B.V.A., at the Berkeley Café, Clifton, 2.30 p.m.

28th (Sat.). Annual reunion of the R.V.C. '52 Club at Ye Miller of Mansfield, Goring.

September

16th to 22nd (Sun. to Sat.). 74th B.V.A. Annual Congress at Royal Leamington Spa.

BRITISH VETERINARY ASSOCIATION QUARTERLY MEETINGS

Wednesday, July 11th, 1956—No. 7, Mansfield Street

10.30 a.m.—Organising Committee.

2.00 p.m.—Home Appointments Committee.

3.30 p.m.—Parliamentary and Public Relations Committee.

Thursday, July 12th, 1956—No. 7, Mansfield Street

10.00 a.m.—Veterinary State Medicine Committee.

12.30 p.m.—Finance Sub-committee.

2.15 p.m.—General Purposes and Finance Committee.

Friday, July 13th, 1956—Connaught Rooms

10.30 a.m.—Council Meeting.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Ayr. Ralstonhill, Hurlford, Kilmarnock (June 13).

Salop. Woodlands Hall, Glazeley, Bridgnorth (June 12).

Somerset. Western Farm, Pedwell, Ashcott, Bridgwater (June 12).

Staffs. Highwood House Farm, Balance Hill, Uttoxeter (June 14).

Yorks. Throstles Nest Farm, Fagley Lane, Bradford (June 8).

Fowl Pest

Derby. Folly House Farm, Brockwell Lane, Chesterfield (June 14).

Essex. Rozell, Dawes Heath Road, Thundersley (June 12); Ninon, Moorcroft Avenue, Thundersley (June 14).

Lancs. Fern Lea, Bluestone Lane, Mawdesley, Ormskirk (June 8); Farnworth House Farm, Duxbury, Chorley (June 9); Woodend Farm, Moss Lane, Southport; Windyridge, Bluestone Lane, Mawdesley, Ormskirk; Tannersmith Lane, Mawdesley (June 11); No. 3 Holding, Farnworth House Estate, Duxbury, Chorley (June 12); Ash Cottage, Alvestone Lane, Mawdesley (June 14).

Lincs. 63, Church Street, Heckington, Sleaford (June 10); 2, Fen Road, Timberland, Lincoln; Sudbrook Grange, Langworth (June 13); Thorn Tree Farm, Barnetby; Old School Buildings, Fiskerton (June 14).

London. Ellis Pet Stores, Shepherd's Bush Market, W.12 (June 14).

Yorks. Dutch Poultry Farm, Osgodby, Selby (June 13).

Swine Fever

Berks. Barnard's Close, Appleford, Abingdon (June 11).

Dunbarton. No. 12 Holding, West Cochno, Duntocher, Glasgow (June 11).

Essex. Chapel Farm, Chapel Lane, Boxted, Colchester (June 8); Great Garlands Farm, Stanford le Hope (June 15).

Hants. The Bungalow, Pitmore, Sway, Lymington (June 8).

Lancs. Boysnope Wharf Piggery, Liverpool Road, Barton Moss, Eccles, Manchester (June 14).

Oxford. The Old Rectory, Wendelbury, Bicester (June 14); Oaklands Farm, Fawler Stonesfield (June 15).

Somerset. Coombe Farm, Wrangway, Wellington (June 12); The Danish Pig and Poultry Farm, Pill, Bristol (June 14).

Staffs. 272, Wolverhampton Road, Springhead, Sedgley (June 9); Barratts Coppice, Stourton, Stourbridge (June 16); Moat Farm, Sutton Road, Barr Beacon, Walsall (June 18).

Sussex. Godsmarks Farm, Ashurst, Steyning (June 8); Tree Tops Farm, Langney Rise, Eastbourne (June 11).

Warwicks. 437, Kingstanding Road, Erdington, Birmingham (June 8); 67, Kings Road, Kings Heath, Birmingham (June 15).

Worcs. The Orchard, Abberley (June 12); Dropping Wells Farm, Bewdley (June 18).

Yorks. South Farm, West Lilling, Flaxton (June 11); Woodlands Farm, Berwick-in-Elmet, Leeds (June 12); Poplar Farm, Camblesforth, Selby (June 16); Hall Farm, Oswaldkirk (June 18).

ADVERTISER'S ANNOUNCEMENT

EVANS MEDICAL SUPPLIES LTD., have now issued NEMAZINE (Trade Mark) TABLETS (Phenothiazine B.Vet.C. 5 gramme) in containers of 50 and 250.